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125. Proposed by F. M. PRIEST, Mona House, St. Louis, Mo.

A Quaker once, we understand
 For his three sons laid off his land,
 And made three equal circles meet
 So as to bound an acre neat.
 Now in the center of the acre,
 Was found the dwelling of the Quaker;
 In centers of the circles round,
 A dwelling for each son was found.
 Now can you tell by skill or art
 How many rods they live ap.

** Solutions of these problems should be sent to B. F. Finkel not later than March 10.

ALGEBRA.

115. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Science, Decorah Institute, Decorah, Iowa.

Find the conditions of the coefficients of a general biquadratic equation so that it may be solved by quadratics.

116. Proposed by ARTEMAS MARTIN, A. M., Ph. D., LL. D., U. S. Coast and Geodetic Survey Office, Washington, D. C.

Solve the equations:

$$\begin{aligned} w(xy+zx+yz) &= a; \quad x(wy+wz+yz) = b; \\ y(wx+wz+xz) &= c; \quad z(wx+wy+xy) = d. \end{aligned}$$

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GEOMETRY.

135. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy, Ohio University, Athens, O.

If a hyperbola be described touching the four sides of a quadrilateral which is inscribed in a circle, and one focus lie on the circle, the other focus will also lie on the circle.

136. Proposed by J. OWEN MAHONEY, B. E., M. Sc., Professor of Mathematics, Central High School, Dallas, Tex.

Construct a triangle having given the base, the median line to the base, and the difference of the base angles.

137. Proposed by J. W. YOUNG, Fellow and Assistant, Ohio State University, Columbus, O.

A right cone has its vertex in a horizontal plane, its axis being perpendicular to the plane. A string has one extremity attached to a point on the cone. The other extremity, P , of the string is kept in the plane, and the string is then wound around the cone, without being allowed to slip. Show that the spiral generated by P cuts all straight lines through the vertex at the same angle.

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CALCULUS.

106. Proposed by M. C. STEVENS, M. A., Professor of Mathematics, Purdue University, Lafayette, Ind.

$$\int_0^{\pi} \frac{\cos rx dx}{1 - 2a \cos x + a^2} = \frac{\pi r^2}{1 - a^2}.$$

[Williamson's Integral Calculus, 6th Edition, page 174.]

107. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy, Irving College, Mechanicsburg, Pa.

The speed of signaling in submarine telegraph-cable varies as $x^2 \log(1/x)$, in which x is the ratio of the radius of the core to that of the covering. Prove that the *maximum speed* is attained when this ratio is $1:\sqrt{e}$.

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MECHANICS.

101. Proposed by ALOIS F. KOVARIK, Instructor in Mathematics and Science, Decorah Institute, Decorah, Iowa.

Find the center of gravity of a cone that has a specific gravity of 1 (one) at the top and 2 (two) at the base.

102. Proposed by WALTER H. DRANE, Graduate Student, Harvard University, Cambridge, Mass.

A heavy particle with a light string attached is placed on the edge of a smooth table. A boy, holding the string horizontally, runs at right angles to the string. Determine the motion of the particle (1) when the boy runs with a uniform velocity; (2) when he runs with a uniform acceleration.

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DIOPHANTINE ANALYSIS.

83. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

Find three numbers in arithmetical progression whose sum is a square and cube.

84. Proposed by SYLVESTER ROBINS, North Branch Depot, N. J.

The n th term of an infinite series of "nests" contains all the prime, integral, rational parallelopipeds that have 3^n for their solid diagonals. It is required to determine the general expression for N =the number of such solids in n th term, and to exhibit the dimensions of all the "eggs" in the first six nests.

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AVERAGE AND PROBABILITY.

88. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

Find the average volume of the tetrahedron formed by joining four random points in a sphere.

89. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

An inch auger-hole is bored at random through a six-inch sphere. Find the average volume of the auger-hole.

90. Proposed by WALTER H. DRANE, Graduate Student, Harvard University, Cambridge, Mass.

During a heavy rain storm a circular pond is formed in a circular field. If a man undertakes to cross the field in the dark, what is the chance that he will walk into the pond? [From *Byerly's Integral Calculus*.

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